

Notice of Allowability

Application No.

10/605,860

Examiner

Robert R. Koehler

Applicant(s)

ZHAO ET AL.

Art Unit

1775

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the originally-filed application papers.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☒ The drawings filed on 05 April 2004 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____



ROBERT R. KOEHLER
PRIMARY EXAMINER
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DETAILED ACTION***Examiner's Amendment***

By way of this informal Examiner's Amendment, the following change is made in the specification. In paragraph [0001], line 3, after the year "2002" insert the wording --, now U.S. Patent No. 6,720,088 B2--. This minor change in the specification is made in order to update the filing status of patent application Serial No. 09/683,700.

Allowable Subject Matter

Claims 1 to 20 are allowed.

The following is an examiner's statement of reasons for allowance: The Examiner believes that U.S. Patent No. 5,482,789 (O'Hara, et al.) and U.S. Patent No. 6,720,088 B2 (Zhao, et al.) represent the most relevant prior art, and these patents have been reviewed very carefully with respect to **(a)** alloy compositions for the substrate, diffusion barrier layer, and overlay (bond) coating and **(b)** the metallurgical structures of the substrate. The Examiner believes that the prior art search has not produced any references which teach, suggest, or disclose applicants' claimed article comprising a substrate and a coating system wherein **(i)** the substrate must contain at least 3 weight percent rhenium and at least one refractory metal selected from the group consisting of tungsten, tantalum, hafnium, molybdenum, niobium, and zirconium, **(ii)** the substrate must *be essentially free of a secondary reaction zone (SRZ) that is deleterious to the mechanical properties of the substrate*, and **(iii)** the claimed article must include a diffusion barrier coating containing at least ruthenium and chromium. Although the O'Hara, et al. patent mentions several alloy compositions suitable for the substrate that do not contain ruthenium (see Alloy Numbers 25 and 26 in TABLE I) as well as suitable alloy compositions that contain ruthenium, the patent fails to teach or reasonably suggest that any protective coating system can prevent the occurrence of a secondary reaction zone in the substrate. The O'Hara, et al. patent mentions only the usage of specific nickel-base superalloy compositions containing ruthenium

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that are coated with a metal selected from the group consisting of aluminum, platinum, and alloys of Al and Pt; see claim 9 (column 22) of the O'Hara, et al. patent. The Examiner notes that neither the nickel-base superalloy compositions which contain ruthenium as taught by O'Hara, et al. nor the usage of a metal coating (i.e., Al, Pt, or alloys of Al and Pt) on the O'Hara, et al. nickel-base superalloy compositions can produce a nickel-base superalloy microstructure that is *essentially free from the formation of a secondary reaction zone*. For example, claim 9 in the O'Hara, et al. patent states that the metal-coated alloy is characterized by a reduced tendency to form SRZ. Also, line 3 in column 18 to line 8 in column 19 of the O'Hara, et al. patent states that the detrimental formation of topologically close-packed phases in the nickel-base superalloy microstructure at elevated temperatures is minimized (but not essentially prevented). Also, the Examiner believes that the prior art search has not produced any references which teach, suggest, or disclose applicants' claimed gas turbine engine component comprising a substrate and a coating system on a surface of the substrate wherein **(i)** the substrate is formed of a nickel-base superalloy which must contain about 4.5 to about 5.75 weight percent rhenium and at least one refractory metal selected from the group consisting of tungsten, tantalum, hafnium, molybdenum, niobium, and zirconium, **(ii)** the superalloy substrate *must be essentially free of a secondary reaction zone (SRZ) that is deleterious to the mechanical properties of the superalloy*, and **(iii)** the claimed article must include a diffusion barrier coating and an overlay coating (on the diffusion barrier coating) that consists essentially of aluminum and at least one element selected from the group consisting of zirconium, hafnium, silicon, and titanium. The Examiner notes that the Zhao, et al. patent does not teach or reasonably suggest a diffusion barrier coating composition which essentially prevents the formation of a secondary reaction zone in the superalloy substrate. Lines 21 to 46 in column 4 of the Zhao, et al. patent refer only to a diffusion barrier layer which reduces the migration of Al and Cr across the "environmental coating"/superalloy substrate interface (reference number **25**

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in Figure 1) by a factor of at least 2 relative to the amount of migration, as measured by the thickness of the diffusion zone, observed under similar conditions where the diffusion barrier (reference number **10**) is absent. Also, the Zhao, et al. patent does not teach or reasonably suggest an overlay coating composition that must include at least one element selected from the group consisting of Zr, Hf, Si, and Ti. The patent only teaches a coating layer of an aluminum-rich material consisting of nickel, aluminum, chromium, and incidental impurities.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Robert Koehler whose telephone number is **(571) 272-1536**. The Examiner can normally be reached on Tuesday to Friday from 9:30 AM to 7:00 PM. The Examiner can also be reached on alternate Mondays.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Deborah Jones, can be reached on **(571) 272-1535**. The fax phone number for the organization where this application or proceeding is assigned is **703-872-9306**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at **866-217-9197** (toll-free).

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Robert R. Koehler

**ROBERT R. KOEHLER
PRIMARY EXAMINER**

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February 18, 2005**